Journal of Artificial Intelligence and Engineering Applications

Website: https://ioinformatic.org/

15th October 2023. Vol. 3. No. 1; e-ISSN : 2808-4519

Digital Image Processing On Kaffir Orange Peel With Canny Edge Detection Algorithm

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Abstract

Object tracking is a form of application of computer vision. To be able to track an object, a stage is needed in the image processing process. Image Processing is a field related to the process of image transformation (image). The image processing process is carried out to obtain better image quality. The harvesting system in kaffir lime is done manually, by choosing fruits whose skin color is green, and not yellowish. Due to the small and asymmetrical size and shape of kaffir lime, manual harvesting systems are still widely used to maintain the quality and quantity of the harvest. In addition, the manual harvesting system can also avoid damage to kaffir lime trees and obtain optimally ripe kaffir limes. Kaffir lime also has genders like humans, namely males and females. In male kaffir lime there is a circle that is more prominent in size underneath, while female kaffir lime has a flat shape. However, for consumption and medicinal purposes both male and female kaffir lime can be used without affecting the taste or quality of the fruit. With the image processing to determine the level of wrinkles on quality kaffir lime peel, kaffir lime will be selected which is usually used for herbal medicines. In this case, the Canny Edge Detection algorithm can be used to identify density edges in kaffir lime peels. Thus, the degree of wrinkles in kaffir lime peel can be calculated and measured to be more accurate. And can be separated quality or non-quality kaffir lime with the image of kaffir lime that has been seen through the image. The results obtained in designing and analyzing the quality of kaffir lime are clearer and more accurate with an image resolution value of 248 x 216 that the orange is included in the female kaffir lime type.The results tested that the right edge detection method in carrying out the edge detection process in the image of kaffir lime peel is the Canny Edge Detection Algorithm. By using the image on the Canny Edge Detection Algorithm, more dense and quality kaffir lime results are obtained so that it can be used for herbal medicine.

Keywords*: *Digital Image, Kaffir lime, Canny edge detection algorithm

1. Introduction

Digital images are obtained from a set of images and videos. Along with the development of technology, now digital image processing techniques will be developed into computer vision. Computer vision is a science that uses image processing to make decisions based on images obtained from sensors. Computer vision and human vision have the same function, with the aim of interpreting spatial data that is data that is indexed more than one dimension. Computer vision techniques can precisely replicate the function of the human eye and improve the human vision system [9]. Object tracking is a form of application of computer vision. To be able to track an object, a stage is needed in the image processing process. Image Processing is a field related to the process of image transformation (image). The image processing process is carried out to obtain better image quality. The harvesting system in kaffir lime is done manually, by choosing fruits whose skin color is green, and not yellowish. Due to the small and asymmetrical size and shape of kaffir lime, manual harvesting systems are still widely used to maintain the quality and quantity of the harvest. In addition, the manual harvesting system can also avoid damage to kaffir lime trees and obtain optimally ripe kaffir limes. Kaffir lime also has genders like humans, namely males and females. In male kaffir lime there is a circle that is more prominent in size underneath, while female kaffir lime has a flat shape. However, for consumption and medicinal purposes both male and female kaffir lime can be used without affecting the taste or quality of the fruit. With the image processing to determine the level of wrinkles on quality kaffir lime peel, kaffir lime will be selected which is usually used for herbal medicines. In this case, the Canny Edge Detection algorithm can be used to identify density edges in kaffir lime peels. Thus, the degree of wrinkles in kaffir lime peel can be calculated and measured to be more accurate. And can be separated quality or non-quality kaffir lime with the image of kaffir lime that has been seen through the image.

2. Research Methods

2.1 Previous Research

Previous research aims to obtain comparison and reference materials. In addition, to avoid presuming similarities with this study. So in this literature review researchers include the results of previous research as follows: The first study was entitled "Comparison of Sobel, Prewitt, Robert and Canny Methods on Edge Detection of Moving Objects". Research with the discussion of computer vision is a field of science from image processing [3]. To be able to recognize shapes, an initial stage in image processing is needed, namely edge detection. The object used in tracking in computer vision is a moving object (video). Edge detection is used to recognize the edges of objects and reduce noise. The edge detection algorithms used in the study were Sobel, Prewitt, Robert and Canny. Tests were conducted on three videos taken from the Matlab library. Testing is carried out using the Simulik Matlab tool. The results of edges and overlay testing show that the Prewitt Algorithm has better edge detection results compared to other algorithms. The Prewitt algorithm produces edges that are smoother and clearer like real objects. Canny's algorithm did not succeed in generating edges on video objects. Sobel and Robert's algorithm can detect edges but it is not as obvious as Prewitt because there are some missing edges. [11]

2.2 Digital Image Processing

Digital image processing is a field of science that studies how an image is formed, processed, and analyzed so as to produce information that can be understood by humans, while an image histogram is a graphic representation that expresses the distribution of color values or the intensity of pixels in the image. (Digital Image Processing) is a scientific discipline that studies techniques in processing images, the image in question is a still image (photo) or moving image (such as recorded video). While the meaning of digital is image processing / images carried out using a computer digitally.[1] RGB stands for Red-Green-Blue, are three basic colors (primary colors) which are generally used as a reference to other colors from the RGB base, we can convert colors into number codes that make the color will appear universal. The computer has packaged the color information into the same color model so that RGB color processing can be done easily.[12] An image can be defined as a two-dimensional function, f(x, y) where x and y are the flat-plane coordinates, and the value of the function f in each pair of coordinates (x, y) is called the intensity or grayscale level of the image at that point. If x, y and f are all finite (finite) and the values are discrete, then the image is called a digital image. A digital image consists of a finite number of elements, each of which has a specific location and value. A digital image can be represented by a matrix consisting of M columns of N rows, where the intersection between columns and rows is called pixel (pixel = picture element), i.e. the smallest element of an image. Pixels have two parameters, namely coordinates and pixel intensity are the basic building blocks of a digital image. [5]

2.3 Kaffir Lime

Kaffir lime (citrus hystrix) is a type of shrub plant that has many benefits, especially the fruit and leaves. Besides being used for flavoring dishes, citrus hystrix has benefits for body health and facial beauty. [10] Kaffir lime leaf extract has organoleptic characteristics such as viscous form there is a layer of oil on the surface, blackish-green color, characteristic smell of kaffir lime leaves, kaffir lime leaf powder that has been tested for moisture content in the extract by maceration or soaking method. The filter solution used is n-hexane because it has good non-polar properties in attracting terpenoid compounds which are non-polar compounds. N-hexane is a type of non-polar solvent that can be used to extract non-polar compounds such as essential oils and derivatives. The results of extracting 300 gr of kaffir lime leaf powder produced an extract of 23.56 gr with a yield calculation of 7.85%, the yield calculation results were relatively small because n-hexane was more selective in dissolving compounds in kaffir lime leaves, namely only non-polar compounds. The oil layer on the surface of the viscous extract indicates that n-hexane can attract essential oil-derived compounds contained in kaffir lime leaves. The results of organoleptic testing of lime leaf extract lotion preparations are green, smell typical of kaffir lime leaves and have a semi-solid and thick texture. Purut lime leaf extract after testing obtained a dark red color while kaffir lime leaf lotion obtained a brick red color. The difference in color obtained is caused by differences in the amount of terpenoid content. The change in color from dark red to brick red means a slight reduction in the terpenoid content of kaffir lime leaf extract to a lotion preparation. This happens because of the influence of adding ingredients and in the manufacturing process to become a preparation of kaffir lime leaf extract lotion. [8]

The following is one example of a kaffir lime image listed below:

Fig. 1: Kaffir Lime

2.4 Canny Edge Detection Algorithm

Canny Edge Detection algorithm is an image processing technique to detect edges in images. This algorithm combines several steps such as smoothing, gradient calculation, non-maximum suppression, and hysteresis to produce accurate and sharp edges in the image. This helps identify the boundaries of objects and separate them from the background in the image. The difference from other algorithms is that Sobel is an edge detection method included in the gradient edge detector. Prewitt has a gradient equation with Sobel but with a constant value equal to 1. Robert is also called the cross operator because of the x direction and the diagonal y direction in quadrant 1. [9]

Operators using 2 kernels of 16 x 16 (Kx and Ky) and magnitude gradient (G) with equations (1), (2), (3). The steps for calculating the Canny Edge Detection Algorithm are below:

1. When the image is smoothed out, the derivatives Ix and Iy wrt x and y are calculated. This can be implemented by combining I with the Canny kernels Kx and Ky, with equations (2.1) and (2.2):

$$K_x = \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix} \quad (1)$$

$$K_y = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix} \quad (2)$$

Definition 2.1: Canny filter for both directions (horizontal and vertical)

2. Then, the magnitude G and slope θ of the gradient are calculated by equation (2.3):

$$G\sqrt{{G_x}^2 + {G_y}^2} \quad (3)$$

Definition 2.2: Gradient intensity and edge direction

Determining the Thresholding Value Using the Equation (2.4)

$$g(x,y) = \begin{matrix} 1, Jika\ f(x,y) > 128 \\ 0, Jika\ f(x,y) < 128 \end{matrix} \quad (4)$$

Definition 2.3: By checking the number if the number value is >128 then the given binary value is 1, if the number value is <128 then the given binary value is 0 [4].

2.5 MATLAB

MATLAB (Matrix Laboratory) is a program for numerical analysis and computation and is an advanced mathematical programming language formed on the basis of thinking using matrix properties and shapes. Initially, the program was an interface for the collection of numeric routines from the LINPACK and EISPACK projects, and was developed using the FORTRAN language but is now a commercial product of the company Mathworks, Inc. which in later developments was developed using the C++ language and assembler (mainly for basic MATLAB functions). MATLAB has evolved into a sophisticated programming environment that contains built-in functions for performing signal processing, linear algebra, and other mathematical calculations. MATLAB also contains a toolbox that contains additional functions for specific applications. MATLAB is extensible, in the sense that a user can write new functions to add to a library when the built-in functions available cannot perform a specific task. The programming skills needed are not too difficult if you already have experience in programming other languages such as C ++, Pascal, or FORTRAN.
MATLAB is a brand of software developed by Mathworks, Inc. Mathworks is the most efficient software for matrix-based numeric calculations. Thus, if in calculations we can formulate problems into matrix format, then MATLAB is the best software for numerical solutions. MATLAB which is a high-level programming language based on matrices is often used for numerical computational techniques, to solve problems involving mathematical operations of elements, matrices, optimization, approximation and others [2].

3. Results And Discussion

3.1 Research Methods

The research method in writing this final project was carried out at the Stabat Traditional Market at local flower traders using the interview method. Research on this thesis follows the methodological stages in research, which are as follows:

To clarify the structure of the research methodology above, the author makes the following explanation:

1. Identify the Problem
   This stage is the initial stage used to identify problems with the aim of observing and looking for problems that are being faced in the object of research, namely looking for the quality of lime density based on the image of edge texture.
2. Gathering Supporting Theories
   Collection of theories related to the subject matter such as theories about image processing, methods used and application design of the required system. In this stage, theories are gathered from several sources such as books, journals, articles and other references.
3. Method Testing
   At this stage, researchers will test the methods used in the process of quality image capture techniques with existing guidance on image theories from books and journals related to the subject matter.
4. System Designer
   At this stage, system design is carried out on the problem being studied, it can be a stage to design the workflow of the system and also design the design of the face-to-face display (interface) of the system to be created.
5. Method Implementation
   Implement methods that have been tested previously with the design of the system that has been made and code according to the programming language used to create the system.
6. System Testing
   In the final stage, a series of tests are carried out on the system that has been made, testing is carried out in order to find errors (errors) in the system and make the necessary improvements

3.2 Research Supporting Data

Kaffir lime has two different types, namely male and female kaffir orange. One of the differences is the level of acidity, where male kaffir limes tend to be more acidic than female kaffir oranges. To distinguish the two, it can be seen from the size of the small circle under the orange, if the circle is large (looks flat) then it is a female kaffir orange, while if the circle is small and more prominent it is a male kaffir orange. In addition, the skin of male kaffir lime is noticeably harder compared to female kaffir lime which is softer. Here is the supporting data, namely kaffir lime seen in Figure.

Fig. 2: Image of Male Kaffir lime

Fig. 3: Image of Famale Kaffir lime

3.3 Application of the Method

One of the edge detection operators is the canny edge detection developed by John F. Canny. There are several most optimal edge detection criteria with the Canny Algorithm well detecting (detection criteria) the ability to lay and mark all existing edges according to the selection of convolution parameters performed. At the same time, it also provides very high flexibility in terms of determining the level of edge thickness detection as desired. The Canny algorithm is an edge detection algorithm performed with a convolution approach to image matrix functions and Gaussian operators. Canny Edge Detection was developed by John F. Canny in 1986 and uses a phased algorithm to detect various edges in an image.[4]

3.4 Algorithm Analysis

Based on the observations that have been made, edge detection to measure the density of wrinkles in kaffir lime through the peel. Looking at the lime peel, there are more wrinkles that will be explained in figure 3.

Fig. 4: Kaffir lime

2. Matrix Convolosi
   Matrix convolution is the process of converting an image into a matrix number to obtain that image into a number. Makes it easy to calculate blocks with pixel size on the Canny Algorithm. Here is a picture that has a black and white image on kaffir orange. To carry out the edge calculation process, the image is converted into black and white. The black and white image of kaffir lime can be seen in Figure 5 as follows:

Fig. 5: Black and White Image of Kaffir Lime

The following convoluti results convert the image image into numbers below which will be used as a calculation of the Canny Edge Detection method:

177 160 135 115 116 127 133 131 123 130 138 135 123 121 134 149 125 **117 120 128 137 161 188 198 149 127 108 109**
123 129 127 125 124 136 **146 146 139 135 150 167 138 123 117 121 131 158 186 196 116 105** 105 **116 123 124 125 131**
132 142 148 149 150 149 161 178 162 139 124 122 **128 152 174 180 100 105 115 122 125 129 139 147 145 149 149 153**
160 **161 167 179 190 164 144 135 135 147 157 154 100 114 121 122 129** 144 **159 162 157 158 155 158 170 171 173 179**
210 183 162 150 143 146 145 **135 115 128 130 117 115 132 155 167 159 187 207 199 180 181 181** 162 **184 194 195 177**
155 140 130 124 120 133 134 120 112 125 148 161 164 **194 220 211 191 191 195 183 180 184 189 182 166 151 141 134**
123 134 **134 119 109 121 145 161 177 204 227 211 186 188 205 206 176 173** 182 **189 182 168 158 153 123 129 128 117**
113 128 156 175 199 218 228 201 **168 172 202 216 180 167 176 195 196 185 177 173 125 126 123 121** 130 **152 179 198**
221 232 233 200 164 164 194 210 187 167 175 199 205 198 **194 191 136 131 127 137 159 183 202 213 227 235 237 211**
178 174 191 **196 189 166 175 201 209 208 207 201 156 145 143 162 191 211 216** 214 216 222 229 217 194 186 190 185
182 165 178 205 215 218 217 206 172 158 156 180 213 228 221 208 201 205 215 212 199 192 190 179 173 161 178 206
217 222 221 206 163 164 169 195 221 218 198 189 183 194 210 210 198 189 177 158 150 153 186 212 214 222 213 176
158 164 176 196 209 201 186 184 193 199 208 203 188 179 171 154 151 162 197 215 204 201 192 164 153 168 184 197
196 183 175 183 196 198 204 198 182 174 168 156 156 173 202 207 189 180 173 155 157 172 189 195 184 171 173 187
188 189 199 197 184 176 171 161 161 172 185 185 176 172 165 154 163 171 183 187 174 165 173 188 175 177 190 194
182 172 166 157 156 161 163 166 178 180 165 151 164 164 171 174 164 159 167 179 165 164 176 182 171 160 157 150
156 162 160 168 193 193 165 146 161 158 163 168 157 152 159 165 156 150 158 163 155 150 156 157 175 187 182 185
207 200 167 151 158 154 161 167 155 148 151 154 149 140 144 149 145 148 162 171 196 214 207 200

3. Canny Edge Detection Method Calculation
   Dividing the image into 16 x 16 pixels to adjust to Canny, then the size of the processed image will be broken into blocks with a size of 16 x 16 pixels per block as in Figures 6 and Figure 7:

Fig. 6: 16 x 16 Image

Table 1: 16 x 16 Sample Image

177	160	135	115	116	127	133	131	123	130	138	135	123	121	134	149
117	120	128	137	161	188	198	149	127	108	109	123	129	127	125	124
146	146	139	135	150	167	138	123	117	121	131	158	186	196	116	105
116	123	124	125	131	132	142	148	149	150	149	161	178	162	139	124
128	152	174	180	100	105	115	122	125	129	139	147	145	149	149	153
161	167	179	190	164	144	135	135	147	157	154	100	114	121	122	129
159	162	157	158	155	158	170	171	173	179	210	183	162	150	143	146
135	115	128	130	117	115	132	155	167	159	187	207	199	180	181	181
184	194	195	177	155	140	130	124	120	133	134	120	112	125	148	161
194	220	211	191	191	195	183	180	184	189	182	166	151	141	134	123
134	119	109	121	145	161	177	204	227	211	186	188	205	206	176	173
189	182	168	158	153	123	129	128	117	113	128	156	175	199	218	228
168	172	202	216	180	167	176	195	196	185	177	173	125	126	123	121
152	179	198	221	232	233	200	164	164	194	210	187	167	175	199	205
194	191	136	131	127	137	159	183	202	213	227	235	237	211	178	174
196	189	166	175	201	209	208	207	201	156	145	143	162	191	211	216

Define the Canny Edge Detection Kx and Ky operators using a matrix of Canny Edge Detection Kx and Ky operators to perform edge detection.
These pixel values will be processed with the Canny Edge Detection method to detect edges in the image. The pixel values of the above images are processed according to the provisions of the Canny Edge Detection method. Convolution grayscale images with horizontal Canny Edge Detection kernel (Kx) and vertical Canny Edge Detection kernel (Ky).

Determining the gradient value of a gray image that has been operated with a matrix mask via Canny Edge Detection is seen in Figure 7.
Kx = (177) (-1) + (117) (-2) + (146) (-1) + (160) (0) + (120) (0) + (146) (0) + (135) (1) + (128) (2) + (139) (1) = -27
Ky = (177) (1) + (160) (2) + (135) (1) + (117) (0) + (120) (0) + (128) (0) + (146) (-1) + (146) (-2) + (139) (-1) = 55
K [f (x,y)] = $\sqrt{-27^2 + 55^2}$ = 2.998
The pixel value obtained from the calculation of pixels operated by the Canny Edge detection method at the point of row 1, column 1 is 2.998.
Kx = (160) (-1) + (120) (-2) + (146) (-1) + (135) (0) + (128) (0) + (139) (0) + (115) (1) + (137) (2) + (135) (1) = -22
Ky = (160) (1) + (135) (2) + (115) (1) + (120) (0) + (128) (0) + (137) (0) + (146) (-1) + (139) (-2) + (135) (-1) = -14
K [f(x,y)] = $\sqrt{-22^2 + (-14)^2}$ = 174

Nilai pixel yang diperoleh dari perhitungan pixel yang dioperasikan dengan metode Canny Edge Detection pada titik baris 1, kolom 2 adalah 174.
Kx = (123) (-1) + (129) (-2) + (186) (-1) + (121) (0) + (127) (0) + (196) (0) + (134) (1) + (125) (2) + (116) (1) = -67

Ky = (123) (1) + (121) (2) + (134) (1) + (129) (0) + (127) (0) + (125) (0) + (186) (-1) + (196) (-2) + (116) (-1) = -195
K [f(x,y)] = $\sqrt{-67^2 + (-195)^2}$ = 37.958

The pixel value obtained from the calculation of pixels operated with Canny Edge Detection at the point of row 1, column 13 is 37,958

Kx = (121) (-1) + (127) (-2) + (196) (-1) + (134) (0) + (125) (0) + (116) (0) + (149) (1) + (124) (2) + (105) (1) = -69

Ky = (121) (1) + (134) (2) + (149) (1) + (127) (0) + (125) (0) + (124) (0) + (196) (-1) + (116) (-2) + (105) (-1) = 5
K [f(x,y)] = $\sqrt{-69^2 + 5^2}$ = -44

The pixel value obtained from the calculation of pixels operated with Canny Edge Detection at the point of row 1, column 14 is -44
The final calculation is the pixel calculation process that continues to completion.
Determining the Thresholding Value

$$g(x,y) = \begin{matrix} 1, Jika\ f(x,y) \geq 128 \\ 0, Jika\ f(x,y) < 128 \end{matrix}$$

Then the binner values given for the numbers 2998, 174, 6142, 16530, 14240, 1576, -144, 756, 954, 72, 10484, 50208, 37958, -44 are 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 1, 1.

Table 2: Grayscale Image Results

2998	174	6142	16530	14240	1576	-144	756	954	72	10484	50208	37958	-44	134	149
117	120	128	137	161	188	198	149	127	108	109	123	129	127	125	124
146	146	139	135	150	167	138	123	117	121	131	158	186	196	116	105
116	123	124	125	131	132	142	148	149	150	149	161	178	162	139	124
128	152	174	180	100	105	115	122	125	129	139	147	145	149	149	153
161	167	179	190	164	144	135	135	147	157	154	100	114	121	122	129
159	162	157	158	155	158	170	171	173	179	210	183	162	150	143	146
135	115	128	130	117	115	132	155	167	159	187	207	199	180	181	181
184	194	195	177	155	140	130	124	120	133	134	120	112	125	148	161
194	220	211	191	191	195	183	180	184	189	182	166	151	141	134	123
134	119	109	121	145	161	177	204	227	211	186	188	205	206	176	173
189	182	168	158	153	123	129	128	117	113	128	156	175	199	218	228
168	172	202	216	180	167	176	195	196	185	177	173	125	126	123	121
152	179	198	221	232	233	200	164	164	194	210	187	167	175	199	205
194	191	136	131	127	137	159	183	202	213	227	235	237	211	178	174
196	189	166	175	201	209	208	207	201	156	145	143	162	191	211	216

Table 3: Binner Calculation Results

1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1
0	0	1	1	1	1	1	1	0	0	0	0	1	0	0	0
1	1	1	1	1	1	1	0	0	0	1	1	1	1	0	0
0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0
1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	0	0	1	1	0	0	0	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

The result of the calculation above is a binner image with the number 0 is the color that shows black and the number 1 image is the color that shows white. Shows the image as a result of the black and white image process.

3.5 Interface Discussion

The explanation of the interface design that has been made by research with edge detection canny algoeritm which has results to see the results of the lime peel detection image program conducted by the study. The following is a discussion of interface design on image systems:

1. Main Display Form
   Edge detection is the main display of the application that has been built and designed so that researchers can provide programmatic simulation information from canny edge detection images. This figure connects users to be able to use edge detection applications with the edge detection canny algorithm. This figure is implemented with the figure in Figure 10.

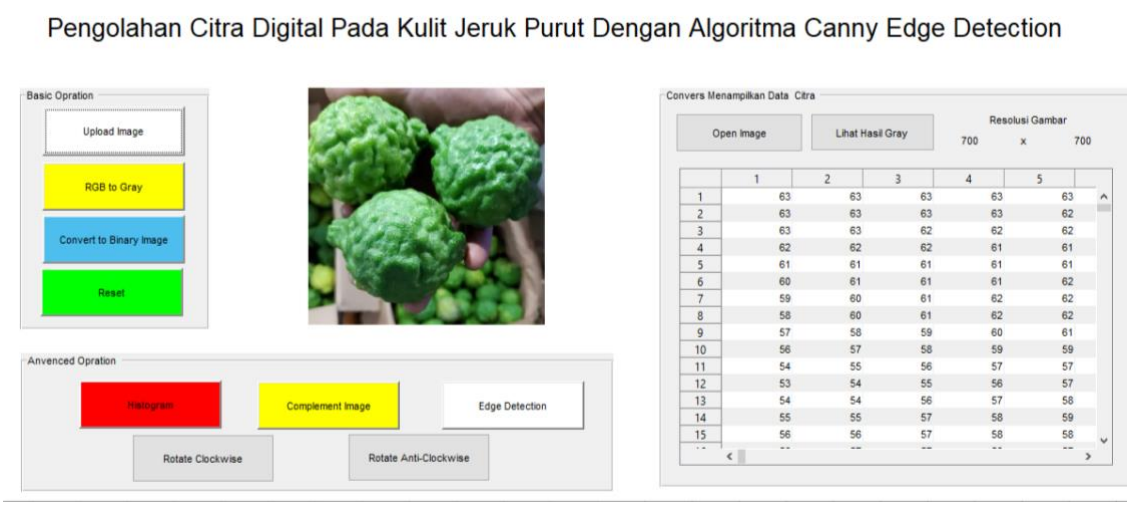

Fig. 7: Image Program

The explanation of the image above is the result of a program that will have been designed by research to facilitate the results of presenting the desired image results. The program explanation steps above will be explained below:

1. Open Image displays image data with images taken that will be converted into numbers.
2. Upload Image retrieves the same image image data as the image displays image data.
3. RGB to Gray displays the image to black and white.
4. Converst to Binary Image converts images to twinkle numbers.
5. Reset if you want the image to be replaced to clean up the layer.
6. To analyze the image results, press the edge detection algorithm canny.
7. The results will appear on the program screen.

4. Conclusions

After doing the explanation in the previous chapter. Then the researcher will provide some conclusions on the results of the program made. The following are the conclusions of research related to kaffir lime peel image processing techniques based on texture images with the Canny Edge Detection Algorithm:

1. The results obtained in designing and analyzing the quality of kaffir lime are clearer and more accurate with an image resolution value of 248 x 216 that the orange is included in the female kaffir lime type.
2. The results tested that the right edge detection method in carrying out the edge detection process in the image of kaffir lime peel is the Canny Edge Detection Algorithm.
3. The results of MATLAB 2014 programming with images obtained the texture of the edges of kaffir lime peel with more wrinkles and denser using the Canny Edge Detection Algorithm.
4. By using the image on the Canny Edge Detection Algorithm, more dense and quality kaffir lime results are obtained so that it can be used for herbal medicine.

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